

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 23 MARS 2000

WIPO

PCT

| | | |
|--|---|--|
| Applicant's or agent's file reference RK590 | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/GB99/03116 | International filing date (day/month/year) 17/09/1999 | Priority date (day/month/year) 17/09/1998 |
| International Patent Classification (IPC) or national classification and IPC H01B3/44 | | |
| Applicant RAYCHEM LIMITED et al. | | |



- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 2 sheets.

- This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

| | |
|---|--|
| Date of submission of the demand 24/12/1999 | Date of completion of this report 22.03.00 |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | Authorized officer Somerville, F Telephone No. +49 89 2399 8307  |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03116

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-7,10-13 as originally filed

8,9 as received on 01/12/1999 with letter of 02/11/1999

Claims, No.:

1-20 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|------|--------|------|
| Novelty (N) | Yes: | Claims | 1-20 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1-20 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1-20 |
| | No: | Claims | |

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB99/03116

2. Citations and explanations

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

V. Reasoned statement with respect to novelty and inventive step:

Reference is made to the following document:

D1 = US-A-3269862

- 1). The present Application satisfies the criterion set forth in Article 33(2) PCT since the subject-matter of Claims 1-20 is new in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).

The prior art cited in the International Search Report does not describe insulation comprising cross-linked layers of polyolefin-based material comprising at least 20wt% of a carbonyl-containing polymer (at least 5wt% carboxylic acid ester monomer content) and a PVDF material.

- 2). The present Application satisfies the criterion set forth in Article 33(3) PCT since the subject-matter of Claims 1-20 involves an inventive step (Rule 65(1)(2) PCT).

Document D1 represents the closest prior art to the subject-matter of Claim 1 of the present Application. D1 describes (Claim 1) an insulating material comprising a first layer of cross-linked polyolefin and a second layer of cross-linked PVDF. The polyolefin can be a copolymer of ethylene and vinyl acetate (col.5, last line-col.6, line 2). The layers are preferably irradiated simultaneously (col.2, l.13-15). The subject-matter of present Claim 1 differs from that of D1 in that the polyolefin layer must comprise at least 20wt% of a carbonyl-containing polymer which has at least 5wt% carboxylic acid ester monomer content. The objective technical problem solved in view of D1 (see second Table on page 8 and

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/03116

first Table on page 9 of the present Application) is the provision of insulation with improved peel strength. The cited prior art gives no hint that this property could be improved by using a polyolefin material as now specified. It is therefore possible to acknowledge an inventive step for the subject-matter of the present Application.

VIII. Certain observations on the Application:

- 1). The peel bond strength is not defined clearly (Art.6, PCT) in either Claim 1 or Claim 2.
- 2). The term "substantially transparent" in Claim 16 is unclear.
- 3). The use of terms such as "preferably" and "especially" in the present claims does not limit their scope in any way.

Example of Effect of Radiation Dose on Bond strength developed between appropriate polyolefin and PVDF-based materials

| Material 1 | Material 2 | Dose(Mrad) | Peel force (N) |
|---|---|------------|----------------|
| EVA copolymer of 25wt% VA content | VDF/HFP copolymer of 10wt% HFP content + 7.5wt% additives | 0 | 0.5 |
| Same as above | Same as above | 15 | 40 |
| EEA copolymer of 15wt% EA content | VDF/HFP copolymer of 10wt% HFP content | 0 | 1 |
| EEA copolymer of 15wt% EA content | VDF/HFP copolymer of 10wt% HFP content | 8 | 24 |
| EEA copolymer of 15wt% EA content | VDF/HFP copolymer of 10wt% HFP content | 20 | 52 |
| Ethylene/acrylic ester/maleic anhydride terpolymer of 19wt% acrylic ester content | VDF/HFP copolymer of 10wt% HFP content | 0 | < 5 |
| Ethylene/acrylic ester/maleic anhydride terpolymer of 19wt% acrylic ester content | VDF/HFP copolymer of 10wt% HFP content | 20 | 21 |

Example of Effect of Percentage Comonomer in Ethylene Copolymer Material on bond strength to appropriate PVDF-based material after electron beam crosslinking

| Material 1 | Material 2 | Dose(Mrad) | Peel (N) |
|-------------------------------------|---|------------|----------|
| EMA copolymer with 9wt% MA content | VDF/HFP copolymer of 10wt% HFP content + 7.5wt% additives | 20 | 4 |
| EMA copolymer with 28wt% MA content | Same as above | 20 | 45 |

Example of Effect of percentage Copolymer in a polyolefin polymer blend on bond strength with appropriate PVDF-based material after electron beam crosslinking

| Material 1 | Material 2 | Dose(Mrad) | Peel force (N) |
|--|--|------------|----------------|
| 100% HDPE | VDF/HFP copolymer of 10wt% HFP content +7.5wt% additives | 20 | 0 |
| 20% HDPE + 80% EEA copolymer of 15wt% EA content | Same as above | 20 | 70 |

Example of Effect of PVDF-based material type on bond strength with appropriate polyolefin based material after electron beam crosslinking

| Material 1 | Material 2 | Dose(Mrad) | Peel (N) |
|-------------------------------------|--|------------|----------|
| EVA copolymer with 25wt% VA content | PVDF homopolymer | 15 | 4 |
| As above | VDF/HFP copolymer of 10wt% HFP content | 15 | 17.5 |

Example of Effect of the addition of Pro-rad in Olefinic Material on bond strength with appropriate PVDF-based material after electron beam crosslinking

| Material 1 | Material 2 | Dose(Mrad) | Peel (N) |
|--|--|------------|----------|
| 20% HDPE + 80% EEA copolymer of 15wt% EA content | VDF/HFP copolymer of 10wt% HFP content +7.5wt% additives | 20 | 70 |
| 19% HDPE + 77%EEA copolymer of 15wt% EA content + 4% TMPTM pro-rad | Same as above | 20 | > 130 |

Examples of Wire Construction

An electrical wire in which the insulation consists of two polymeric layers bonded together according to the present invention was made as follows:

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

COMMUNICATION IN CASES FOR WHICH
NO OTHER FORM IS APPLICABLE

To:

JAY, Anthony, W.
Raychem Limited
IPLD
Faraday Road
Dorcan, Swindon
Wiltshire SN3 5HH
ROYAUME-UNI

| | |
|--|---|
| Date of mailing (<i>day/month/year</i>) 07 December 1999 (07.12.99) | |
| Applicant's or agent's file reference RK590 | REPLY DUE see paragraph 1 below |
| International application No. PCT/GB99/03116 | International filing date (<i>day/month/year</i>) 17 September 1999 (17.09.99) |
| Applicant RAYCHEM LIMITED | |

1. ☐ REPLY DUE within _____ months/days from the above date of mailing
- ☐ NO REPLY DUE, however, see below
- ☒ IMPORTANT COMMUNICATION
- ☐ INFORMATION ONLY

2. COMMUNICATION:

The applicant in respect of the above identified international application is notified that the receiving Office (RO/GB) has stamped an incorrect international filing date on the first and last pages of the request and has now informed the International Bureau of the corrected date

Please correct all notifications previously sent by the International Bureau to indicate the correct filing date of: **17 September 1999**

instead of: **20 September 1999**

Form PCT/IB/316 is now considered null and void.

A copy of this notification has been sent to the receiving Office (RO/GB), the International Searching Authority (ISA/EP) and all designated Offices already informed of their designation.

| | |
|---|--|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland | Authorized officer F. Gateau |
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

PCT INTERNATIONAL COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

JAY, Anthony, W.
TYCO ELECTRONICS UK LIMITED
IPLD
Faraday Road
Dorcan, Swindon
Wiltshire SN3 5HH
ROYAUME-UNI

| | |
|---|--|
| Date of mailing (day/month/year) 19 February 2001 (19.02.01) | IMPORTANT NOTIFICATION |
| Applicant's or agent's file reference RK590 | |
| International application No. PCT/GB99/03116 | International filing date (day/month/year) 17 September 1999 (17.09.99) |

1. The following indications appeared on record concerning:

☒ the applicant

 ☐ the inventor

 ☐ the agent

 ☐ the common representative

Name and Address

RAYCHEM LIMITED
Faraday Road
Dorcan
Swindon
Wiltshire SN3 5HH
United Kingdom

State of Nationality

GB

State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person

 ☒ the name

 ☐ the address

 ☐ the nationality

 ☐ the residence

Name and Address

TYCO ELECTRONICS UK LIMITED
Faraday Road
Dorcan
Swindon
Wiltshire SN3 5HH
United Kingdom

State of Nationality

GB

State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

THE AGENT'S ADDRESS HAS BEEN CHANGED, ACCORDINGLY.

4. A copy of this notification has been sent to:

| | |
|--|---|
| <input checked="" type="checkbox"/> the receiving Office | <input type="checkbox"/> the designated Offices concerned |
| <input type="checkbox"/> the International Searching Authority | <input checked="" type="checkbox"/> the elected Offices concerned |
| <input type="checkbox"/> the International Preliminary Examining Authority | <input type="checkbox"/> other: |

| | |
|---|--|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35 | Authorized officer Eugénia Santos Telephone No.: (41-22) 338.83.38 |
|---|--|

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing:

30 March 2000 (30.03.00)

International application No.:

PCT/GB99/03116

Applicant's or agent's file reference:

RK590

International filing date:

17 September 1999 (17.09.99)

Priority date:

17 September 1998 (17.09.98)

Applicant:

RODWAY, Giles, Henry

1. The designated Office is hereby notified of its election made:



in the demand filed with the International preliminary Examining Authority on:

24 December 1999 (24.12.99)



in a notice effecting later election filed with the International Bureau on:

2. The election



was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer:

J. Zahra

Telephone No.: (41-22) 338.83.38

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|--|---|--|
| Applicant's or agent's file reference RK590 | FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. | |
| International application No. PCT/GB 99/ 03116 | International filing date (day/month/year) 17/09/1999 | (Earliest) Priority Date (day/month/year) 17/09/1998 |
| Applicant RAYCHEM LIMITED et al. | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures.

INTERNATIONAL SEARCH REPORT

National Application No

PCT/GB 99/03116

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01B3/44 H01B7/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | US 3 269 862 A (LANZA V L, STIVERS E C) 30 August 1966 (1966-08-30) column 5, line 63 -column 6, line 2; examples 1-3 ---- | 1,2,17 |
| A | US 3 650 827 A (BROWN CHESTER A ET AL) 21 March 1972 (1972-03-21) column 1, line 25 - line 38 ---- | 1,2,17 |
| A | EP 0 528 611 A (CHAMPLAIN CABLE CORP) 24 February 1993 (1993-02-24) example 1 ---- | 1,2,17 |
| A | US 5 589 028 A (ROBINSON DONALD N ET AL) 31 December 1996 (1996-12-31) cited in the application the whole document ----- | 1,2,17 |

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

18/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Shade, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03116

| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|---|---------------------|----------------------------|-----------|---------------------|
| US 3269862 | A | 30-08-1966 | NONE | | |
| US 3650827 | A | 21-03-1972 | NONE | | |
| EP 0528611 | A | 24-02-1993 | US | 5206459 A | 27-04-1993 |
| | | | JP | 5205536 A | 13-08-1993 |
| | | | US | 5262591 A | 16-11-1993 |
| | | | US | 5313017 A | 17-05-1994 |
| | | | US | 5262592 A | 16-11-1993 |
| US 5589028 | A | 31-12-1996 | BE | 1010238 A | 07-04-1998 |
| | | | CA | 2156659 A | 04-05-1996 |

PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| | | |
|--|-----------|---|
| (51) International Patent Classification ⁷ : H01B 3/44, 7/02 | A1 | (11) International Publication Number: WO 00/17889 (43) International Publication Date: 30 March 2000 (30.03.00) |
| (1) International Application Number: PCT/GB99/03116 (22) International Filing Date: 17 September 1999 (17.09.99) (30) Priority Data: 9820214.6 17 September 1998 (17.09.98) GB (71) Applicant (for all designated States except US): RAYCHEM LIMITED [GB/GB]; Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): RODWAY, Giles, Henry [GB/GB]; The Old School, 20B The Green, Calne, Wiltshire SN11 8DJ (GB). (74) Agent: JAY, Anthony, W.; Raychem Limited, IPLD, Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB). | | (81) Designated States: AU, BR, CA, CN, CZ, HU, ID, IL, IN, JP, KR, MX, NO, PL, RO, RU, TR, US, ZA, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> |
| (54) Title: ELECTRICAL WIRE INSULATION | | |
| (57) Abstract <p>An electrical wire or cable having insulation comprising (i) at least a first layer of a polyolefin-based formulation, of which at least 20 %, preferably at least 40 %, more preferably at least 60 % or very preferably at least 80 % of the weight of the polymeric portion of the said formulation consists of a carbonyl-containing polymer (homopolymer or copolymer or terpolymer), of which polymer the or at least one constituent monomer is a carboxylic acid ester, preferably an acrylate or acetate, especially an alkyl acrylate (preferably methyl acrylate, ethyl acrylate, propyl acrylate or butyl acrylate), the said monomer itself constituting at least 5 %, preferably at least 9 %, more preferably at least 15 % by weight of the said co-, or ter- polymer when used, and the remainder or the majority of the remainder of the said co-, or ter- polymer preferably being derived from olefinic monomer, preferably ethylene; in contact with (ii) at least a second layer of another material formulation, containing at least 10 %, more preferably at least 50 %, very preferably at least 90 %, especially 100 %, by weight of the second layer, of polyvinylidene fluoride (PVDF), or especially preferably a copolymer based on VDF with a partially or fully fluorinated co-monomer, most preferably a copolymer of VDF and hexafluoropropylene (HFP); wherein the said layers (i) and (ii) whilst in contact with each other have been subjected to cross-linking reaction, preferably by radiation, more preferably ionising radiation, sufficient to prevent delamination of the two layers during a 1 hour acetone immersion test at 23 °C, or to increase the peel bond strength between the said layers to at least 5N according to the ASTM B1876-95 method described below preferably increasing the bond strength by at least 50 %, more preferably by at least 100 %, especially by at least 500 % or 1000 %, compared to that between the uncrosslinked layers.</p> | | |

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

| | | | | | | | |
|----|--------------------------|----|---------------------|----|-----------------------|----|--------------------------|
| AL | Albania | ES | Spain | LS | Lesotho | SI | Slovenia |
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| AT | Austria | FR | France | LU | Luxembourg | SN | Senegal |
| AU | Australia | GA | Gabon | LV | Latvia | SZ | Swaziland |
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| CM | Cameroon | | Republic of Korea | PL | Poland | | |
| CN | China | KR | Republic of Korea | PT | Portugal | | |
| CU | Cuba | KZ | Kazakistan | RO | Romania | | |
| CZ | Czech Republic | LC | Saint Lucia | RU | Russian Federation | | |
| DE | Germany | LI | Liechtenstein | SD | Sudan | | |
| DK | Denmark | LK | Sri Lanka | SE | Sweden | | |
| EE | Estonia | LR | Liberia | SG | Singapore | | |

INTERNATIONAL SEARCH REPORT

Internatic Application No

PCT/GB 99/03116

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01B3/44 H01B7/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | US 3 269 862 A (LANZA V L, STIVERS E C) 30 August 1966 (1966-08-30) column 5, line 63 -column 6, line 2; examples 1-3 --- | 1,2,17 |
| A | US 3 650 827 A (BROWN CHESTER A ET AL) 21 March 1972 (1972-03-21) column 1, line 25 - line 38 --- | 1,2,17 |
| A | EP 0 528 611 A (CHAMPLAIN CABLE CORP) 24 February 1993 (1993-02-24) example 1 --- | 1,2,17 |
| A | US 5 589 028 A (ROBINSON DONALD N ET AL) 31 December 1996 (1996-12-31) cited in the application the whole document ----- | 1,2,17 |

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

18/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040. Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Shade, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internati- Application No

PCT/GB 99/03116

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|---|---|---------------------|----------------------------|---------------------|
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| US 3650827 | A | 21-03-1972 | NONE | |
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